NSHP Calculator Version 2.4 Training

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NSHP Training Workshop

Installing the NSHP Calculator

- Need to have a PC platform with MS Windows operating system

  (Windows 2000, XP, Vista).
- Need to have Microsoft Excel

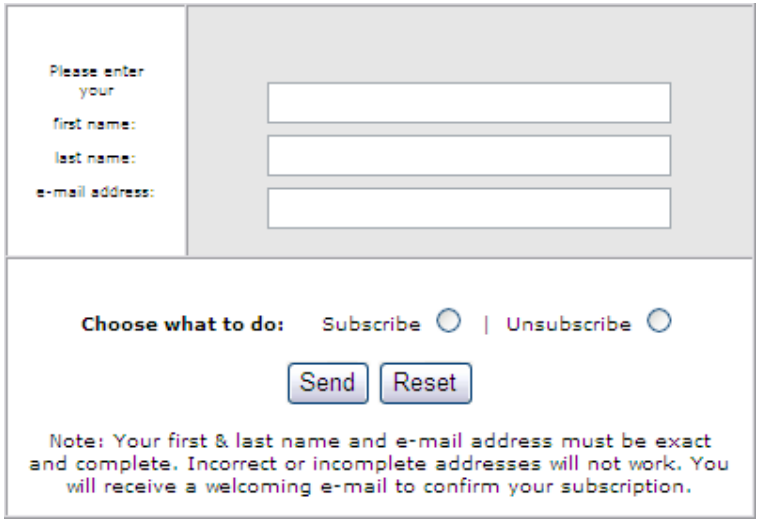
  (2000, 2002, 2003, 2007)
- Must be run from a writable disc (typically a hard drive).
- It will not run from write-protected media such as a CD or DVD.

Registering for Updates

http://www.gosolarcalifornia.org/nshpcalculator/index.html

- Registering with CEC allows users to get updates in a timely manner.
- Need to provide name and email address.
- Registration is voluntary. Can use calculator without registering.

CECPV Calculator Version 2.4
Updated: January 29, 2010



Certified Versions of the Calculator

http://www.gosolarcalifornia.org/nshpcalculator/download_calculator.html

- To determine if an older version of the NSHP calculator is still certified, go to the link provided above.

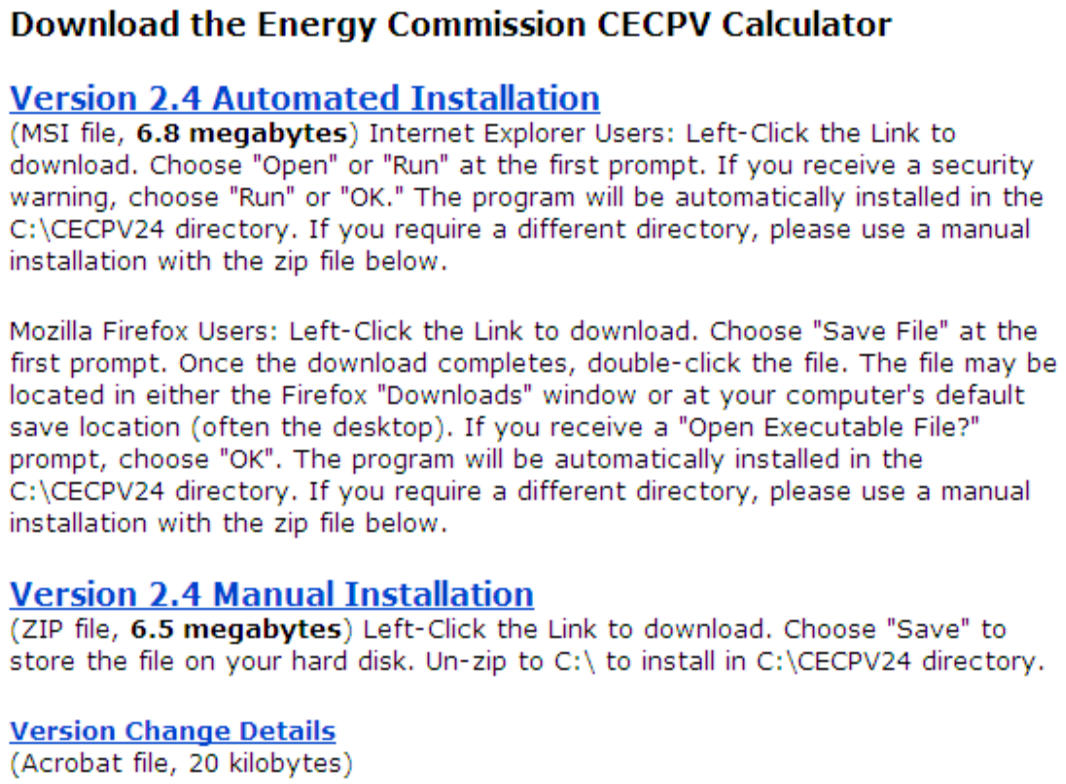
NSHP applications must use a version of the NSHP CECPV Calculator that is listed as "certified" on the date the NSHP application is postmarked (or date of submission for electronic NSHP applications).

Version Number	Release Date	Libraries	Decertified Date	Currently Certified
v2.4	January 29, 2010	Mod2.4a/Inv2.4a	None scheduled	Yes
v2.3 Update 16	January 12, 2010	Mod2.3q/Inv2.3p	March 1, 2010	Yes
v2.3 Update 15	October 27, 2009	Mod2.3p/Inv2.3o	March 1, 2010	Yes
v2.3 Update 14	October 15, 2009	Mod2.3o/Inv2.3n	March 1, 2010	Yes
v2.3 Update 13	September 8, 2009	Mod2.3n/Inv2.3m	March 1, 2010	Yes
v2.3 Update 12	July 16, 2009	Mod2.3m/Inv2.3l	March 1, 2010	Yes

Downloading the NSHP Calculator

http://www.gosolarcalifornia.org/nshpcalculator/download_calculator.html

- Using the Automated Installation will simplify the process.
- Manual Installation lets you choose where to install the calculator.



Download the Energy Commission CECPV Calculator

Version 2.4 Automated Installation
(MSI file, **6.8 megabytes**) Internet Explorer Users: Left-Click the Link to download. Choose "Open" or "Run" at the first prompt. If you receive a security warning, choose "Run" or "OK." The program will be automatically installed in the C:\CECPV24 directory. If you require a different directory, please use a manual installation with the zip file below.

Mozilla Firefox Users: Left-Click the Link to download. Choose "Save File" at the first prompt. Once the download completes, double-click the file. The file may be located in either the Firefox "Downloads" window or at your computer's default save location (often the desktop). If you receive a "Open Executable File?" prompt, choose "OK". The program will be automatically installed in the C:\CECPV24 directory. If you require a different directory, please use a manual installation with the zip file below.

Version 2.4 Manual Installation
(ZIP file, **6.5 megabytes**) Left-Click the Link to download. Choose "Save" to store the file on your hard disk. Un-zip to C:\ to install in C:\CECPV24 directory.

Version Change Details
(Acrobat file, 20 kilobytes)

Downloading the Inverter/Module Updates for the NSHP Calculator

- Equipment lists are updated on a regular basis.
- Using the automated install will simplify the installation process.

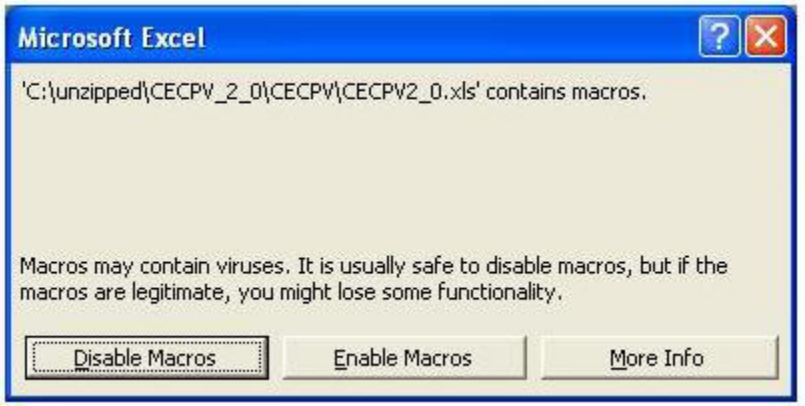
New **Download the module/inverter update for the CECPV Calculator**

Module/Inverter Update Automated Installation
(MSI file, 204 kilobytes) Left-Click the Link to download. Choose "Open" or "Run" at the first dialog window. Depending on your Windows settings, you may get a security warning. If you get a warning, choose "Run" or "OK". The files will be automatically placed in the same directory where the calculator is installed. If you require a different directory, please use a manual installation with the zip file below.

Module/Inverter Update Manual Installation
(ZIP file, 32 kilobytes) Left-Click the Link to download. Choose "Save" to store the file on your hard disk. The files must be unzipped to the same directory where the calculator is installed.

Opening the Calculator

- Must enable macros before using the calculator.
  - For Excel 2000, 2002, or 2003 you will see a pop-up like this.

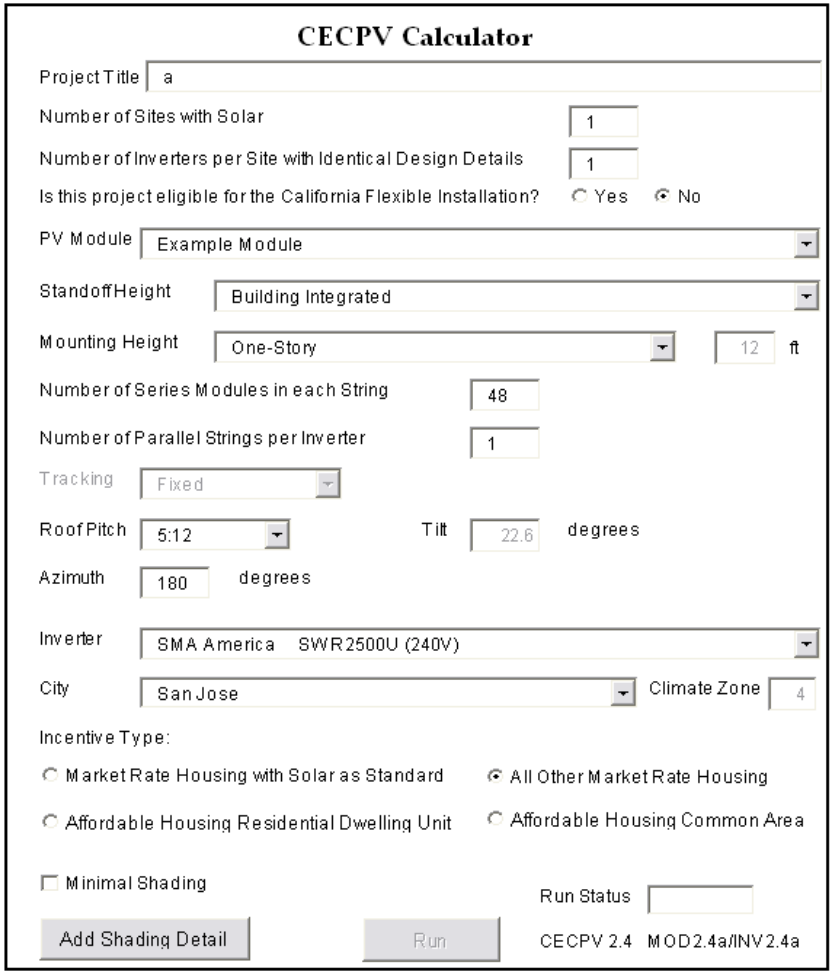


- For Excel 2007 please go to the following link and follow the instructions provided:

http://www.gosolarcalifornia.ca.gov/nshpcalculator/Excel_2007_Security_Level.pdf

Entering Information in the Calculator

- Calculator input page is the first page a user sees, unlike the previous version.
- Instructions for how to enter information in each field are included with the calculator.
- If project meets minimal shading criterion, check the 'Minimal Shading' box and click the 'Run' button.



- For details about each of the fields, refer to the instructions on the right side of the calculator input page.

Instructions:

1. To qualify for a NSHP incentive, residential buildings must receive electricity distribution service, at the site of installation of the PV system, from either Pacific Gas & Electric, San Diego Gas & Electric Company, Southern California Edison, or Golden State Water Company (doing business as Bear Valley Electric Service). On the list of cities within the calculator, there are cities that are not served by the above utilities.
2. Number of Sites with Solar means the number of physical addresses where a solar energy system is proposed to be installed. Typically this will be 1 unless the project is a development.
3. Number of Inverters per Site with Identical Design Details means the number of inverters per site where all installation characteristics of the array are identical. For microinverters, this number will be greater than 1.
4. The California Flexible Installation (CFI) option is allowable only when solar energy systems are proposed for multiple sites. CFI is applicable when all of the proposed solar energy systems meet the following conditions:
   - Azimuth range is from 150 degrees to 270 degrees
   - Tilt corresponds to a roof pitch between 0:12 and 7:12
   - The minimal shading criterion is met
   - Systems are Fixed (non-tracking)
   - The major system components (modules and inverter) are identical in make and quantity
5. Standoff height is the minimum distance from the mounting surface to the back of the modules.
6. Mounting height is the distance from the ground to the lowest point on the array.
7. Click for information on tracking types.
8. Select the roof pitch (rise/run) or select Enter Tilt to enter tilt in degrees (between 0 and 90).
9. Azimuth of array; 180 degrees is due South, 90 due East, 270 due West
10. Select a city; if your city is not listed, choose the city that was used in your Title 24 energy efficiency calculations.
    Click for Energy Commission Climate Zone Information.

    * Click for Google Earth Climate Zone Overlay (Google Earth must be installed on your computer).

    + Click for City of San Diego Development Services climate zone map.

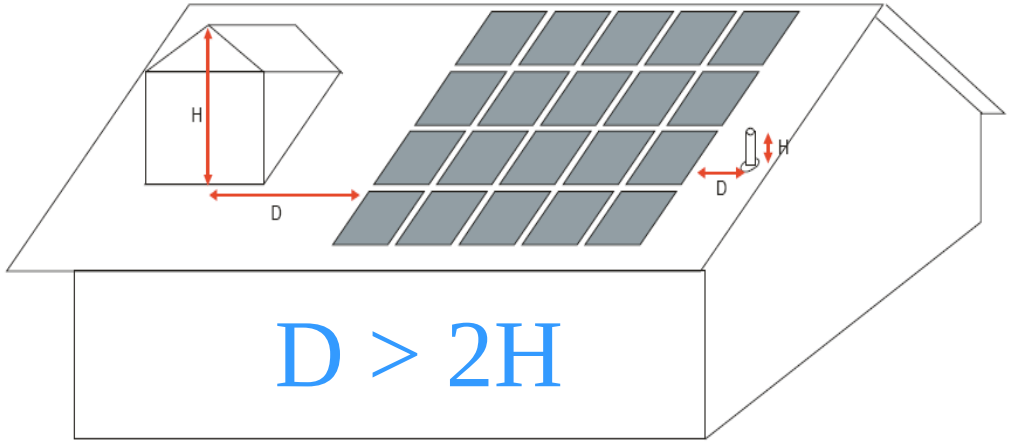
    # Building Department uses electronic mapping services. Verify climate zone with building department.
11. Market Rate Housing with Solar as Standard applies when a minimum of 50% of the residences in a development, with 6 or more residences, have PV systems as a standard feature.
12. All Other Market Rate Housing applies to custom homes, developments with fewer than 6 residences, developments where PV systems are optional, and any other residential application that does not fit the other categories.
13. Check Minimal Shading only if there are no shading obstructions (including the mature height of planned trees) which fail to meet the minimal shading criteria. Minimal shading criteria is met only if all obstructions are at a distance, more than twice their height, from the array. For installations with shading obstructions that fail to meet the minimal shading criteria, click the Add Shading Detail button.
14. Click the Run button to begin the simulation. The program will process the data and estimate monthly and annual kWh production and calculate the NSHP incentive. The Run button will only work for simulations that are Minimal Shading.

California Flexible Installation (CFI)

- Only allowed when solar energy systems are proposed for multiple sites.
- CFI is applicable only under the following conditions:
  - Azimuth range between 150 and 270 degrees
  - Tilt corresponds to a roof pitch between 0:12 and 7:12
  - The Minimal Shading Criteria is met
  - Systems are non-tracking (fixed).
  - Major system components (modules and inverters) are identical in make and quantity
- Calculator will give a warning when CFI is proposed for only one site.

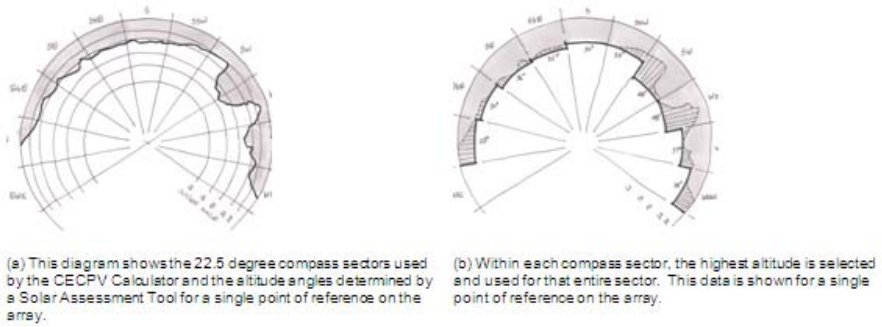
Minimal Shading Criterion

- States that no obstruction is closer than a distance ("D") of twice the height ("H") it extends above the PV modules.
- Obstructions include:
  - Vents, Chimneys, architectural feature, mechanical equipment that project above the roof
  - Any part of a neighboring terrain that projects above the roof
  - Any tree that planted or planned
  - Any existing or planned neighboring building
  - Any utility pole closer than thirty feet from the nearest point of the array



Accounting for Actual Shading

- "D" and "H" values can be found with a tape measure.
- Altitude Angle can be measured with a digital protractor.
- A solar assessment tool can determine existing shading obstructions using the "four corners" method.



(a) This diagram shows the 22.5 degree compass sectors used by the CECPV Calculator and the altitude angles determined by a Solar Assessment Tool for a single point of reference on the array.

(b) Within each compass sector, the highest altitude is selected and used for that entire sector. This data is shown for a single point of reference on the array.

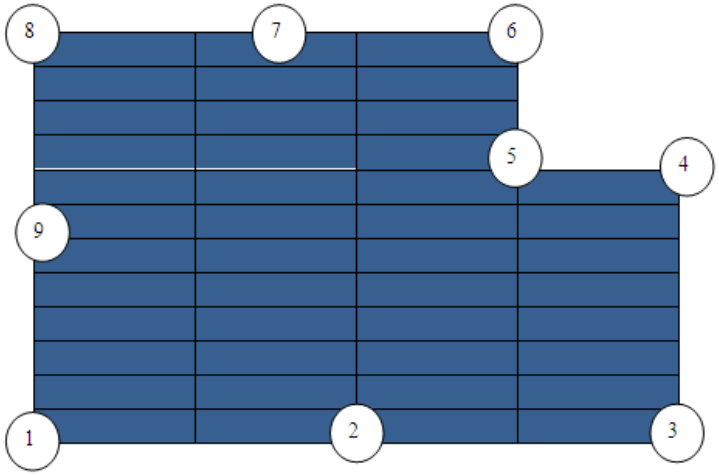
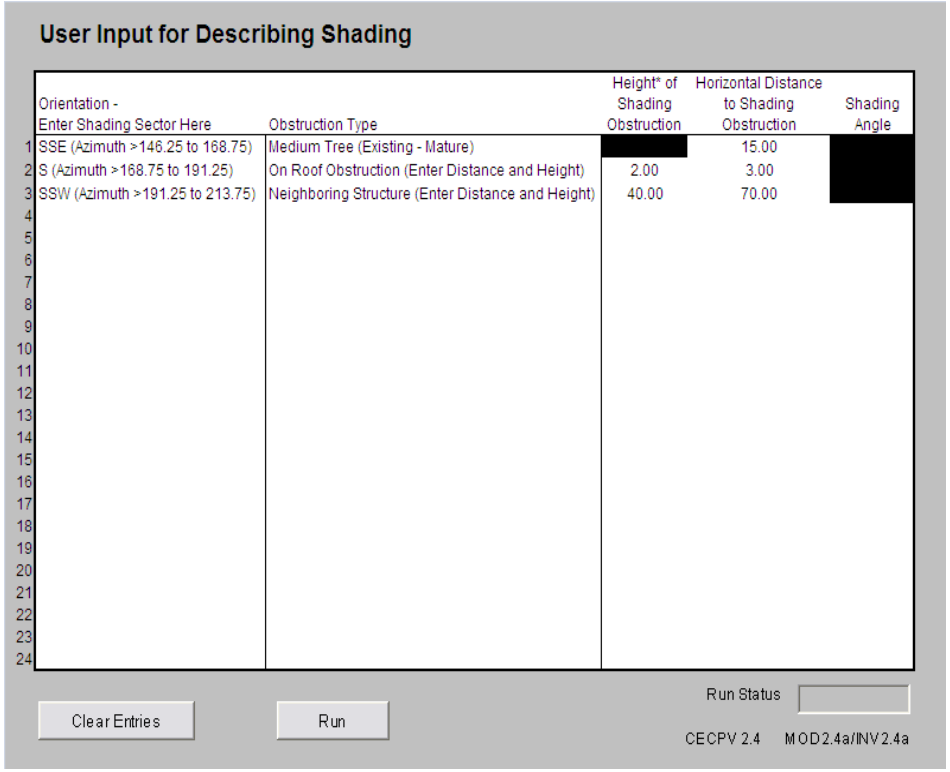


Figure 8 – Example of Points where Measurement shall be made using a Solar Assessment Tool (overall array dimensions 76 feet by 50 feet)

Adding Shading Details

- Necessary when Minimum Shading Criterion is not met.
- Instructions for how to enter information are given on the right side of the page. Examples of how to enter information are also provided



User Input for Describing Shading

	Orientation - Enter Shading Sector Here	Obstruction Type	Height* of Shading Obstruction	Horizontal Distance to Shading Obstruction	Shading Angle
1	SSE (Azimuth >146.25 to 168.75)	Medium Tree (Existing - Mature)		15.00	
2	S (Azimuth >168.75 to 191.25)	On Roof Obstruction (Enter Distance and Height)	2.00	3.00	
3	SSW (Azimuth >191.25 to 213.75)	Neighboring Structure (Enter Distance and Height)	40.00	70.00	
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
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17					
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20					
21					
22					
23					
24					

Clear Entries

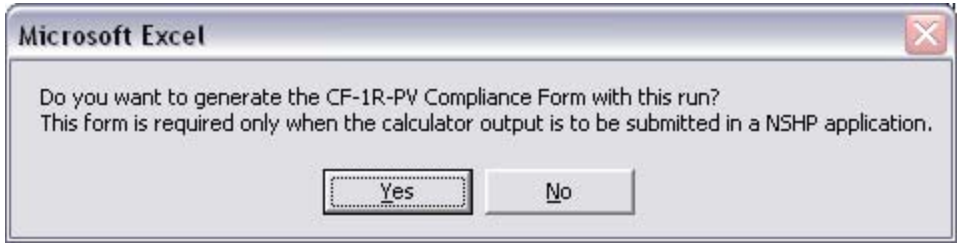
Run

Run Status

CECPV 2.4 MOD2.4a/INV2.4a

Running the NSHP Calculator

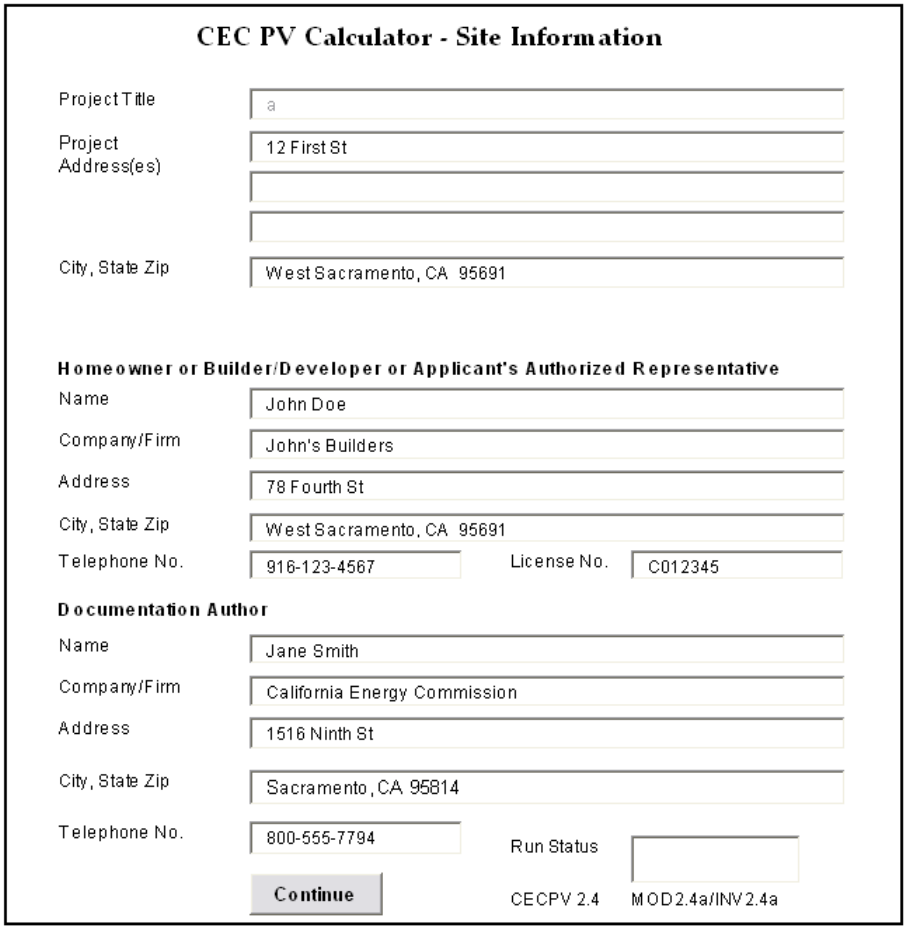
- Before the calculator runs, user must choose if they want compliance forms to be generated with the output.



- Generate forms only if an NSHP application is going to be submitted with a CF-1R-PV form. Requires entering Site Information.
- Forms not necessary if you only want to compare results with different configurations.

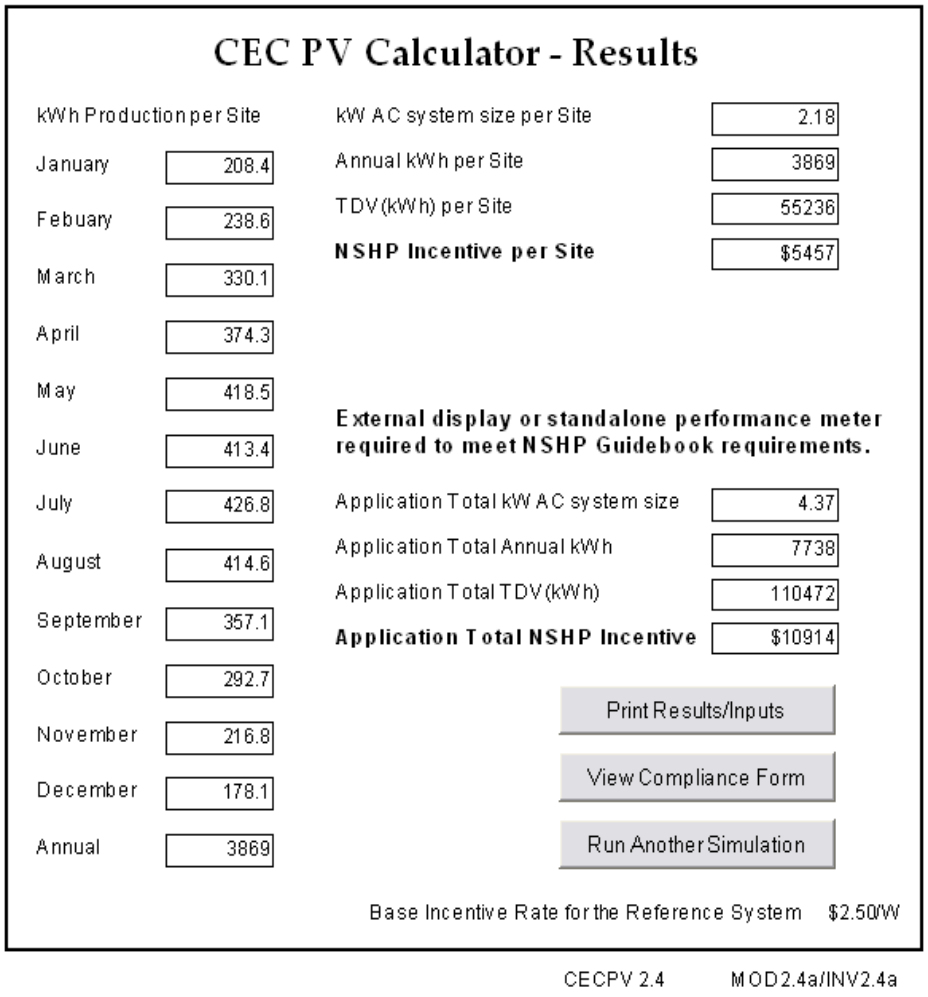
Entering Site Information

- For multiple site applications, make sure to enter all Project Addresses or lot numbers.
- Documentation author can be homeowner, builder, PV system retailer/installer/designer or a Certified Energy Plans Examiner (CEPE)



Results Page

- Expected production results and incentive amounts are given for each site and the overall application.



CEC PV Calculator - Results

kWh Production per Site	
January	208.4
Febuary	238.6
March	330.1
April	374.3
May	418.5
June	413.4
July	426.8
August	414.6
September	357.1
October	292.7
November	216.8
December	178.1
Annual	3869

kW AC system size per Site	2.18
Annual kWh per Site	3869
TDV (kWh) per Site	55236
NSHP Incentive per Site	$5457

External display or standalone performance meter required to meet NSHP Guidebook requirements.

Application Total kW AC system size	4.37
Application Total Annual kWh	7738
Application Total TDV (kWh)	110472
Application Total NSHP Incentive	$10914

Print Results/Inputs

View Compliance Form

Run Another Simulation

Base Incentive Rate for the Reference System $2.50/W

CECPV 2.4 MOD2.4a/INV2.4a

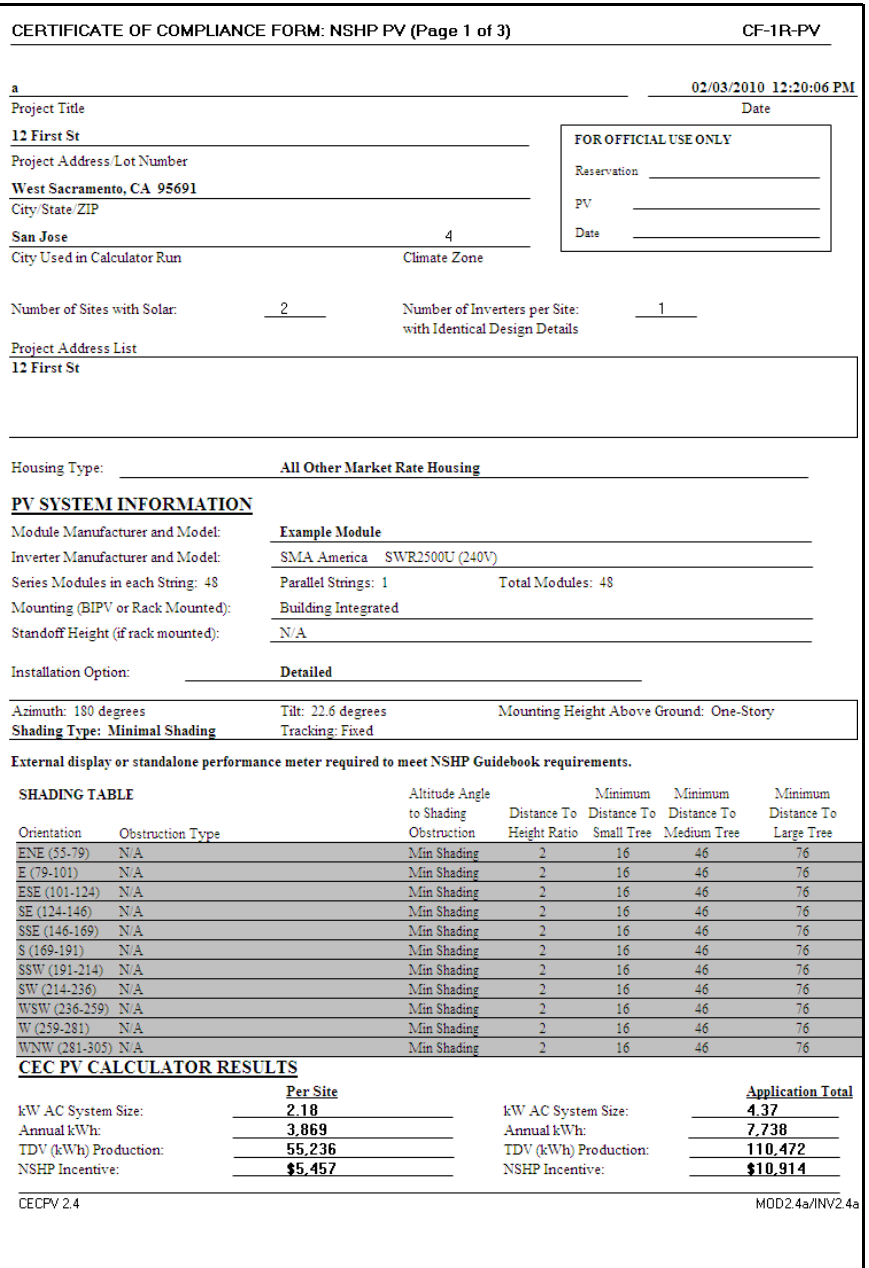
Results Page (cont.)

- The results also displays all of the user inputs for the application.

CEC PV Calculator - Inputs	
Project Title:	a
Number of Sites with Solar:	1
Number of Inverters per Site with Identical Details:	1
California Flexible Installation:	No
PV Module:	Example Module
Standoff Height:	Building Integrated
Mounting Height	One-Story
Number of Series Modules in each String:	48
Number of Parallel Strings per Inverter:	1
Tracking:	Fixed
Roof Pitch:	5:12
Azimuth:	180
Inverter:	SMA America SWR2500U (240V)
City Used in Calculator Run:	San Jose
Incentive Type:	All other Market Rate Housing
Minimal Shading:	Yes

Compliance Forms

- The first page of the CF-1R-PV summarizes information about the project location, the PV system, and the calculator results.
- Pages two and three can be seen by clicking on their respective tabs at the bottom of the screen.
- The PV system and shading table information will be used by the installer and HERS rater for field verification.



CERTIFICATE OF COMPLIANCE FORM: NSHP PV (Page 1 of 3) CF-1R-PV

a — 02/03/2010 12:20:06 PM
Project Title — Date

12 First St
Project Address/Lot Number

FOR OFFICIAL USE ONLY
Reservation
PV
Date

West Sacramento, CA 95691
City/State/ZIP

San Jose — 4
City Used in Calculator Run — Climate Zone

Number of Sites with Solar: 2
Number of Inverters per Site: with Identical Design Details: 1

Project Address List
12 First St

Housing Type: All Other Market Rate Housing

PV SYSTEM INFORMATION

Module Manufacturer and Model: Example Module
Inverter Manufacturer and Model: SMA America SWR2500U (240V)
Series Modules in each String: 48 Parallel Strings: 1 Total Modules: 48
Mounting (BIPV or Rack Mounted): Building Integrated
Standoff Height (if rack mounted): N/A

Installation Option: Detailed

Azimuth: 180 degrees Tilt: 22.6 degrees Mounting Height Above Ground: One-Story
Shading Type: Minimal Shading Tracking: Fixed

External display or standalone performance meter required to meet NSHP Guidebook requirements.

SHADING TABLE

Orientation	Obstruction Type	Altitude Angle to Shading Obstruction	Distance To Height Ratio	Minimum Distance To Small Tree	Minimum Distance To Medium Tree	Minimum Distance To Large Tree
ENE (55-79)	N/A	Min Shading	2	16	46	76
E (79-101)	N/A	Min Shading	2	16	46	76
ESE (101-124)	N/A	Min Shading	2	16	46	76
SE (124-146)	N/A	Min Shading	2	16	46	76
SSE (146-169)	N/A	Min Shading	2	16	46	76
S (169-191)	N/A	Min Shading	2	16	46	76
SSW (191-214)	N/A	Min Shading	2	16	46	76
SW (214-236)	N/A	Min Shading	2	16	46	76
WSW (236-259)	N/A	Min Shading	2	16	46	76
W (259-281)	N/A	Min Shading	2	16	46	76
WNW (281-305)	N/A	Min Shading	2	16	46	76

CEC PV CALCULATOR RESULTS

	Per Site		Application Total
kW AC System Size:	2.18	kW AC System Size:	4.37
Annual kWh:	3,869	Annual kWh:	7,738
TDV (kWh) Production:	55,236	TDV (kWh) Production:	110,472
NSHP Incentive:	$5,457	NSHP Incentive:	$10,914

CECPV 2.4 MOD2.4a/INV2.4a

Field Verification Table (FVT)

- Used by the installer and HERS rater to verify system performance at a specific irradiance and temperature.
- This table is for one inverter. An exception is microinverters.

CERTIFICATE OF COMPLIANCE FORM: NSHP PV (Page 2 of 3) CF-1R-PV

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Project Title — The power output values in this table are for one inverter. For microinverters only, the values are for the specified Number of Inverters per Site with Identical Design Details. — Date

FIELD VERIFICATION TABLE FVT110

Irradiance on Tilted Surface	Temperature (degrees Fahrenheit)																				
(W/m²)	T=15	T=20	T=25	T=30	T=35	T=40	T=45	T=50	T=55	T=60	T=65	T=70	T=75	T=80	T=85	T=90	T=95	T=100	T=105	T=110	T=115	T=120
300	613	605	597	590	582	574	567	559	551	543	535	527	518	510	502	494	486	477	469	461	452	444
325	663	655	647	638	630	621	613	605	596	588	579	570	562	553	544	535	526	517	508	499	490	481
350	713	705	696	687	678	668	659	650	641	632	623	613	604	594	585	576	566	556	547	537	527	517
375	764	754	744	735	725	715	706	696	686	676	666	656	646	636	626	615	605	595	585	574	564	554
400	814	804	793	783	772	762	752	741	730	720	709	698	688	677	666	655	644	633	622	611	600	589
425	864	853	842	831	820	809	797	786	775	763	752	741	729	718	706	695	683	671	660	648	636	624
450	914	902	890	878	867	855	843	831	819	807	795	783	771	758	746	734	721	709	697	684	672	659
475	962	950	938	926	913	901	888	876	863	850	837	824	812	799	786	773	760	746	733	720	707	694
500	1010	997	985	972	959	946	933	920	906	893	879	866	852	839	825	811	797	783	770	756	742	728
525	1058	1044	1031	1017	1004	990	977	963	949	935	921	907	892	878	864	849	835	820	805	791	776	761
550	1105	1091	1077	1063	1048	1034	1020	1005	991	976	962	947	932	917	902	887	872	856	841	826	810	795
575	1151	1137	1122	1107	1092	1077	1062	1047	1032	1017	1002	986	971	955	940	924	908	892	876	860	844	827
600	1198	1182	1167	1151	1136	1120	1105	1089	1073	1057	1041	1025	1009	993	976	960	944	927	911	894	877	860
625	1243	1227	1211	1195	1179	1163	1146	1130	1113	1097	1080	1063	1046	1030	1013	996	979	961	944	927	909	892
650	1288	1272	1255	1238	1221	1204	1187	1170	1153	1136	1118	1101	1083	1066	1048	1031	1013	995	977	959	941	923
675	1333	1316	1298	1281	1263	1246	1228	1210	1192	1174	1156	1138	1120	1102	1083	1065	1046	1028	1009	991	972	953
700	1377	1359	1341	1323	1304	1286	1268	1249	1231	1212	1193	1174	1156	1137	1118	1099	1079	1060	1041	1022	1002	983
725	1420	1401	1383	1364	1345	1326	1307	1288	1269	1249	1230	1210	1191	1171	1151	1132	1112	1092	1072	1052	1032	1011
750	1463	1443	1424	1405	1385	1365	1346	1326	1306	1286	1266	1246	1225	1205	1185	1164	1144	1123	1102	1081	1061	1040
775	1505	1485	1465	1445	1424	1404	1384	1363	1342	1322	1301	1280	1259	1238	1217	1196	1175	1153	1132	1110	1089	1067
800	1546	1525	1505	1484	1463	1442	1421	1400	1378	1357	1336	1314	1292	1271	1249	1227	1205	1183	1161	1139	1116	1094
825	1587	1565	1544	1522	1501	1479	1457	1435	1414	1391	1369	1347	1325	1302	1280	1257	1235	1212	1189	1166	1143	1120
850	1626	1605	1582	1560	1538	1516	1493	1471	1448	1425	1403	1380	1357	1334	1310	1287	1264	1240	1217	1193	1169	1146
875	1666	1643	1620	1597	1574	1551	1528	1505	1482	1458	1435	1411	1388	1364	1340	1316	1292	1268	1244	1219	1195	1170
900	1704	1681	1657	1634	1610	1587	1563	1539	1515	1491	1467	1442	1418	1394	1369	1344	1320	1295	1270	1245	1220	1195
925	1742	1718	1694	1669	1645	1621	1596	1572	1547	1522	1498	1473	1448	1423	1397	1372	1347	1321	1295	1270	1244	1218
950	1779	1754	1729	1704	1679	1654	1629	1604	1579	1553	1528	1502	1476	1451	1425	1399	1373	1346	1320	1294	1267	1241
975	1815	1789	1764	1738	1713	1687	1661	1635	1609	1583	1557	1531	1505	1478	1452	1425	1398	1371	1344	1317	1290	1262
1000	1980	1824	1798	1772	1746	1719	1693	1666	1639	1613	1586	1559	1532	1505	1478	1450	1423	1395	1367	1339	1312	1284
1025	1980	1980	1980	1804	1777	1750	1723	1696	1669	1641	1614	1586	1558	1531	1503	1475	1446	1418	1390	1361	1333	1304
1050	1980	1980	1980	1980	1809	1781	1753	1725	1697	1669	1641	1613	1584	1556	1527	1499	1470	1441	1412	1382	1353	1324
1075	1980	1980	1980	1980	1980	1811	1782	1754	1725	1696	1667	1638	1609	1580	1551	1522	1492	1463	1433	1403	1373	1343
1100	1980	1980	1980	1980	1980	1980	1811	1781	1752	1723	1693	1664	1634	1604	1574	1544	1514	1484	1453	1423	1392	1362
1125	1980	1980	1980	1980	1980	1980	1980	1809	1779	1749	1718	1688	1658	1627	1597	1566	1535	1504	1473	1442	1411	1380
1150	1980	1980	1980	1980	1980	1980	1980	1835	1805	1774	1743	1712	1681	1650	1619	1587	1556	1524	1493	1461	1429	1397
1175	1980	1980	1980	1980	1980	1980	1980	1980	1830	1798	1767	1735	1704	1672	1640	1608	1576	1544	1511	1479	1446	1414
1200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

CECPV 2.4 MOD2.4a/INV2.4a

The power output values in this table are for one inverter. For microinverters only, the values are for the specified Number of Inverters per Site with Identical Design Details.

Compliance Statement

- This form must be submitted with signatures from the person who completed the documentation.

CERTIFICATE OF COMPLIANCE FORM: NSHP PV (Page 3 of 3) CF-1R-PV

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Project Title — Date

COMPLIANCE STATEMENT

This certificate of compliance lists the PV features and specifications needed to comply with the NSHP Guidebook requirements. This certificate has been signed by the individual with overall project responsibility. The undersigned recognizes that the PV installation will require installer testing and certification and field verification by an approved HERS rater.

Homeowner or Builder/Developer or Applicant's Authorized Representative

Name: John Doe
Title/Firm: John's Builders
Address: 78 Fourth St
West Sacramento, CA 95691
Telephone: 916-123-4567
Lic. #: C012345

(signature) (date)

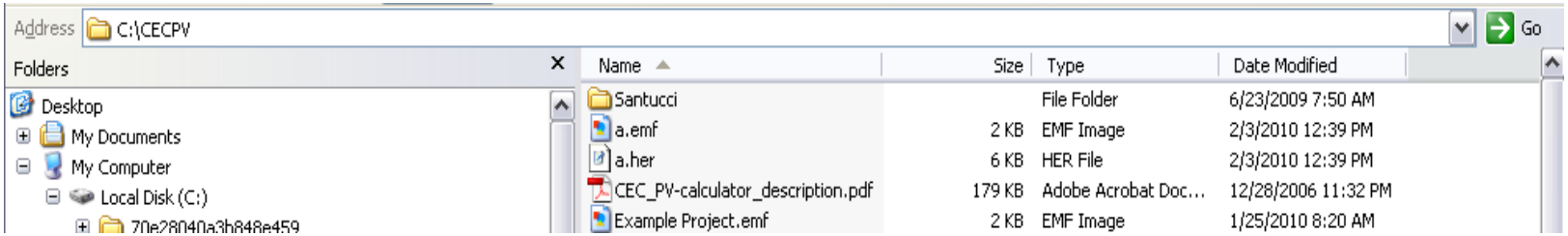
Documentation Author

Name: Jane Smith
Title/Firm: California Energy Commission
Address: 1516 Ninth St
Sacramento, CA 95814
Telephone: 800-555-7794

(signature) (date)

Where to find .emf and .her files

- After running the calculator, go to the C:\ directory and open the **CECPV** folder.



- The .emf and .her files will be found in this folder with the file names being the same as the application's project title.
- If the project title is re-used in a new calculator run, the existing files will be overwritten.
- Email or send these files to the NSHP program administrator with your signed CF-1R-PV so that this information can uploaded to the HERS database.